Governor's Upper Yellowstone River Task Force
Meeting Summary
January 21, 2003
Yellowstone Inn
Meeting began at 7:00 p.m.

I. Introductions

Members Present:	Doug Ensign	Bob Wiltshire
John Bailey, Chair	Jerry O'Hair	Ellen Woodbury
Dave Haug, Vice Chair	Brant Oswald	
Andy Dana	Rod Siring	

Mike Gilbert, proxy for Allan Steinle, Corps Ex-Officio
Joel Tohtz, FWP Ex-Officio
Laurence Siroky, DNRC Ex-Officio

Others Present:			Dale Siegle
Liz Galli-Noble, Coordinator	Karl Biastoch	Bill Moser	Tom Arrandale
Kelly Wade, Secretary	Thomas Hallin	Jim Barrett	Scott McMillion
Daryl Smith	Chuck Dalby	Bruce Rich	Jason Lehmann
Doug Rider	Al Zale	Scott Bosse	Bonnie Francies
Steve Caldwell	Larry Stephenson	Zack Bowen	Jim Francies

II. Prior Meeting Minutes

Liz Galli-Noble: I'll just make a quick announcement: I am waiting for a couple clarifications from Mike Merigliano, as the Task Force members probably read in the draft minutes that I sent you last week. I'm sorry, I was unable to mail the minutes out to the public because they're not complete. But I did provide copies that are in draft form for the public at this meeting.

John Bailey: So we should then wait until the next meeting to approve them. Any other comments on the minutes?

Liz Galli-Noble: If I may add: please look over the minutes, and if you see any need for corrections, let me as soon as possible, so that I can make all the necessary edits before mailing them out for full review.

Discussion and approval of the January 7, 2003 meeting minutes was postponed until the February 11, 2003 Task Force meeting.

III. Financial Updates

EXPENDED GRANTS			
Grant Name	**Completed**	**Amount**	**Study Component**
DNRC Watershed Planning Assistance Grant	6/30/99	2,100.00	Physical Features Inventory
DNRC HB223 Grant	7/30/99	10,000.00	Aerial photography
DNRC Riparian/Wetlands Educational Grant	6/30/00	960.99	*Hydrologic Response to the 1988 Fires* Workshop
DEQ 319 Grant (1st)	9/30/00	40,000.00	Coordinator position
DNRC Watershed Planning Assistance Grant	1/31/01	10,000.00	Watershed Land Use Study
DEQ Start-Up Grant	6/26/01	49,138.00	Coordinator position, Admin secretary, additional cross-sections, operating expenses.
DNRC HB223	10/1/01	6,500.00	Riparian Trend Analysis
BLM Funding	10/26/01	10,000.00	Wildlife Study
DEQ 319 Grant (2nd)	3/21/02	58,000.00	Coordinator position
DEQ 319 Grant (3rd)	9/30/02	44,000.00	Coordinator position
EPA RGI Grant	12/20/02	30,000.00	Geomorphology study

CURRENT GRANTS			
Grant Name	**Amount**	**Spent**	**Remaining Balance**
DNRC RDGP Grant (expires 7/03)	299,940.00	288,621.63	11,318.37
DEQ 319 Grant (4th) (expires 3/04)	122,200.00	23,713.61	98,486.39

IV. Research Presentation #6. Fish Populations Study – Comparative Use of Modified and Natural Habitats of the Upper Yellowstone River by Juvenile Salmonids

1. Meeting Format and Introductions

John Bailey: Before I introduce tonight's presenters, I want to go over the rules that we use for study presentations to the Task Force. There are two parts to our research presentation process. If you were here last time, we had a long discussion about how we are not following our own agenda. The first part of this meeting is the research presentation, and we ask that there be no questions until the presenters are finished. When they are finished, we will have a question and answer session. The Task Force will be allowed to ask questions of the research first, followed by the public. Your questions cannot be speculative, nor can you ask questions that don't relate to the research. When the questions are done, we move into a general discussion session. At that point, again the Task Force will be the first to speak, and then we'll open it up again to the public. The distinction between the two is that the first part is questions just of the research—they have to be scientific, you can't ask the researcher to speculate on something that the data does not support. In the general discussion, we can discuss anything, and how it might fit with some of our views or our questions. But I want it to be clear that there are two parts to this, and that it's unfair to ask the researcher to speculate on something that the data doesn't support. They are here to present and explain their data and their analysis of that data, and we have no right to take them out into left field. So there is a distinction there.

Tonight is actually our sixth presentation. It's the Fish Population Study—Comparative Use of Modified and Natural Habitats of the Upper Yellowstone River by Juvenile Salmonids. I would now like to introduce Dr. Al Zale and Doug Rider, our presenters tonight.

2. Research Presentation #6. Fish Populations Study

See *Attachment A. Comparative Use of Modified and Natural Habitats of the Upper Yellowstone River by Juvenile Salmonids.*

Note: This presentation was videotaped and may be viewed upon request. Contact the Task Force coordinator if you wish to borrow the videotape.

Al Zale read aloud and answered the following questions:

IN RELATIONSHIP TO THE FISH POPULATIONS STUDY….

1. Recognizing your study's budget and time constraints, how comprehensive are your data relative to the Task Force study area of the Yellowstone River?

In one sense, not very comprehensive, because our study area was strongly confined compared to the Task Force study area; we had to work where bank stabilization was already widely extant, which limited our geographic presence. On the other hand, our work was focused on two especially relevant areas where a variety of natural banks and stabilized banks were present. Furthermore, we examined two distinct and different reaches, which thereby conferred greater applicability of our findings than if we had studied only one reach.

2. Have you found significant differences in your results relative to different geomorphic sub-reaches of the Task Force study area of the Yellowstone River? Why? Why not?

Yes, abundances of brown trout at the different bank types followed somewhat different patterns in our two reaches. Specifically, abundances at outside bends and jetties were lower than expected in the lower reach than in the upper reach relative to abundances at the other bank types. Possible explanations: Juvenile brown trout tended to be found at moderate water velocities and outside bends in the lower reach tended to have higher water velocities than in the upper reach. Rainbow trout abundances at jetties were especially high in the lower reach–perhaps high enough to exclude brown trout.

3. How important is the connectivity between the floodplain and river in the interpretation of your data?

The ephemeral side channels were rapidly colonized by juvenile fish during the brief intervals they were flooded, demonstrating strong connectivity between the river and the floodplain.

4. How have the resources you studied in the Upper Yellowstone River changed over the last 50 to 300 years?

Very few main-channel banks were stabilized 50 years ago; none were stabilized 300 years ago. Both rainbow trout and brown trout were introduced about 100 years ago.

5. Are there any particular river conditions–natural or anthropogenic–that your results indicate are important stressors on the river processes that you studied?

Riverbed incision, if exacerbated by bank stabilization, would affect side channel frequency and duration of flow. Also, bank stabilization may preclude formation of new side channels.

6. Recognizing the short-term nature of your study, do you think that the condition of Upper Yellowstone River Watershed–for example, its vegetation cover, recent drought, altering events such as fires, timber cutting, grazing, and residential development–have influenced your research results, relative to the river processes you studied?

Drought was likely especially influential. Low water may have caused some main-channel bank types to be used more or less than during a normal water year. Side channels were used for shorter durations than if flow persisted for longer periods. Fish densities in the side channels may not have achieved the potential carrying capacities of those habitats because duration of flow was too short for fish to build up to such densities.

7. What portion of your results do you see integrating with results of other Task Force studies?

The "fish habitat study" integrates directly with our work in that it will integrate our fish abundance data with their habitat data to make inferences about how habitat changes will affect juvenile fish abundances.

Perhaps investigators associated with some of the other studies can help us better understand how bank stabilization affects side channel frequency and duration of flow. For example, is bank stabilization causing incision? If so, how does a certain amount of incision in a given reach change the frequency and duration of flow in side channel in that reach?

8. What other questions were raised by your research?

How important are main-channel bank habitats for salmonid recruitment versus other potential nursery habitats (e.g., tributaries, spring creeks)? That is, do the results of our comparative-use study really matter (if many adult fish originate from main-channel bank nursery habitats), or are they irrelevant (if main-channel banks contribute little to overall recruitment)?

What are the effects of bank stabilization on habitat of sub-adult and adult fish, spawning habitat quality and quantity, and fish forage production?

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3. Question and Answer Session

Dave Haug: Early on, you talked about five repeat sites. I was wondering how the data changed from year to year, from 2001 to 2002? And was the change in that number consistent with the overall change in the whole of your data? You said you had some numbers for two years along the banks, and I wanted to see how the five repeat ones compared with that.

Al Zale: Let me see if I can find that. Doug do you have any thoughts on that?

Doug Rider: Well, on those repeats, I would say for 2001, they only ran on average three to ten days. So I had to run in there, during over-night hours, and these channels were changing. They're either going up or going down. So there were fewer fish, definitely, in those repeats in 2001. And you can see that in 2002 they ran one to three weeks. The longer they ran, the more fish we've seen. I believe that we're up on an average three to nine, between 2001and 2002. Is that what you're asking?

Dave Haug: So, they were comparable, the whole study on the five repeat studies?

Doug Rider: Right.

Al Zale: I'm looking at the actual data here. Just superficially, you've got those five samples that were at the same five sites in two years. It looks like in three, it was higher in 2002; and in two it was higher in 2001. So, it's hard to say.

Dave Haug: The other thing is, in the fall of 2001 versus fall of 2002, you have a couple of areas there that you said were from 12 to 26 on the test sites. Should you keep it with the 12? Where you have a different number of test samples for that other 14? Is that going to vary?

Al Zale: The statistical magic takes care of that, so it doesn't wind up affecting things. The thing is that they're all randomly selected, so they're all essentially measuring the same thing.

Dave Haug: Even though it's two different years, and you had two different areas?

Al Zale: Yes. You can correct for that. You're better off going with the larger sample size total than to exclude samples, because then you have less confidence in the information. So there is a reason for this.

Andy Dana: I've got a couple of questions. I realize that it was hard to sample the side channels, but I wonder whether you can conclude that the side channels have any statistical significance at all to fish, juvenile fish, as an important habitat during flood flows? Because you have no way to judge how important non-ephemeral channels are. In other words, those fish may have just been swept into the side channels; they didn't necessarily seek it out. You also don't have statistics on mortality of those fish that are swept into those side channels, which are very ephemeral. Is that a concern?

Al Zale: Only in that you're asking the question. I think that it was difficult to really say much about, say, survival over that short a period of time: three to ten days, or just several weeks. There are reasons to think that maybe survival would be higher in there, and there are also reasons to think survival would be lower in there. Maybe wading birds are getting the fish, but they are also then getting away from the big fish that are chowing down on them. When you say that those fish are being "swept" in there, kind of like random particles, and that they're not really selecting that—I'm not really sure that that's true. I think that if that were not a habitat that they were interested in staying in, they would continue to move along. So the fact that they entered into them relatively quickly, and built to higher and higher densities as time went on, I think does suggest that that is a preferred habitat.

Andy Dana: The data shows that they build a higher density over time?

Al Zale: Yes.

Andy Dana: Did you show, or did you see it drop off then? As the water dropped?

Al Zale: Yes, it does. When it's dry.

Doug Rider: I think I can answer the question where you asked about fish getting "swept in". Especially in 2001, I came over here every two days and looked at the channels, and they were changing entirely. I've actually seen some side channels starting to form. These fish were never, I never found—depending on air temperatures and water—I've never seen them at the start of an edge on the side channel, where the side channel started. We could actually see that water starting to flow, and they were always at the bottom and at the mouth of that side channel. They were in that little area, and when it started to flow, they moved instantly up into the channel. You could actually see them in a matter of hours. So they were never actually <u>swept</u> into the side channels, they moved into them.

Andy Dana: I guess the larger question though is the statistical significance of their use of that. Because I walk along ephemeral side channels that have dried up, and I see hundreds of juvenile fish that are going to be goners; I mean they are goners. And we don't know how important that is relative to all the juvenile fish throughout the main channel. Is that a fair statement?

Al Zale: All the more reason we've got to keep those side channels flowing. If they had water, then those fish wouldn't be dying.

Andy Dana: I must be missing something. Another question that I had is: why did you choose not to do winter sampling? My understanding is that that's a high period of stress for fish and in general is it not for juvenile fish. Wouldn't it be important to know where the juvenile fish are hanging out in the winter?

Al Zale: We would have sampled them in the winter, if we could have. It was just physically impossible and dangerous. And that was part of the reason why we sampled as late into fall as we did, to get an idea of where the fish were going for their overwintering habitat. Because by November, they're already moving into those kinds of areas. So, I think the fall data should give you a pretty good suggestion of where the fish then overwintered.

Andy Dana: Getting back to the side channels. Another question that I have is that we've had geomorphology and hydrology studies that have shown that much of, probably most of, the habitat on the Yellowstone in our study area doesn't have side channels; geologically it doesn't form side channels. And as a result, again, I'm wondering why you're continuing to maintain the importance of side channels, when I don't really see the statistics there?

Al Zale: There are side channels out there, we found them.

Andy Dana: From Yankee Jim Canyon to Point of Rocks?

Al Zale: In these two reaches that we studied.

Andy Dana: I'm talking about in our study area [from Gardiner to Springdale].

Al Zale: I don't know anything about the other parts of it. We were restricted to these two areas, and we did have side channels in those areas. We estimated absolute abundances of fish therein, and the side channels are there, and the fish are in them. Now, maybe further upstream, or further downstream, I have no idea. I haven't studied them in those places. I won't get into the speculation stuff we were talking about.

Andy Dana: Just one last question, in terms of your concern about incision of the main channel and cutting off side channels, does it matter that the incision is caused by riprap or jetties, which juvenile fish like?

Al Zale: I think you have to balance things and you'd have to do the math to figure out which ends up being better or worse.

Bob Wiltshire: A couple questions. First, you did single-pass electrofishing on each of the 50-meter sections, is that correct?

Al Zale: Correct. Yes, single-pass, and then the number of fish that were caught in that single-pass was what we wound up using.

Bob Wiltshire: Then my question is this: did you do any multiple-pass studies to try to gauge your efficiency on the single pass?

Al Zale: Yes. I'm pleased you should have that question, actually. Give us a minute and I will show you a figure to help answer the question.

Bob Wiltshire: Okay, I'll ask something different while we are waiting.

Al Zale: Sure, and then we can come back to this.

Bob Wiltshire: Okay. Particularly in jetties, looking at your graph/chart, if I interpret it correctly, you saw a large degree of variance in numbers from site to site?

Al Zale: Yes, and that was largely a function of one or two sites that tended to have some really high numbers of outliers.

Bob Wiltshire: Okay, then that leads to the real question that I was getting at here. One of the things that we're hoping to look at is where bank stabilization will be done; we want to know the best ways to do it. Did you guys gather any anecdotal or empirical data that would say one method is better than another?

Al Zale: Well you simply compare those means, that'll help discern which ones are better or worse, in a comparative sense.

Bob Wiltshire: You indicated that there were a couple of almost outliers on jetties, and you had high numbers of fish. Were there unique characteristics there that could be replicated in other jetties?

Al Zale: That is a possibility. To date, we haven't done that kind of analyses. Doug is planning on doing that for his thesis, which will be completed sometime this summer. He'll be taking a much closer look at some of the habitat variables, and then perhaps he may be able to discern some of those kinds of relationships and find out just how big the boulders really need to be.

Bob Wiltshire: Great, thanks.

Al Zale: Going back to the capture probability question, we did do multiple passes at a number of the different bank types, and natural probabilities for capture were done—probability being essentially the likelihood that a fish in one of those habitats would get caught—and we compared those statistically and didn't find any significant difference. The overall mean was 0.743, so the odds of any fish being in any one of these bank types and getting caught during our single pass, was 74.3 percent. If you wanted to then estimate the actual number of juveniles there, not just from that single pass, you could take the single pass number and divide it by 0.743 and that would give you a pretty good estimate of the total number.

Bob Wiltshire: So you feel pretty confident about those samples.

Al Zale: I do.

Bob Wiltshire: But there wasn't a lot of sampling error, generally speaking.

Al Zale: They were not significantly different.

Bob Wiltshire: Great. I'm curious as to your ability to tell the difference between a Yellowstone cutthroat and a rainbow at 50 millimeters.

Doug Rider: It was very hard. We didn't see very many Yellowstone cuts, as you saw in the presentation. There are some things about the Yellowstone where rainbows supposedly spawn about April or May, or possibly a lot of the year, so we had problems with that. There are some guidelines that you can apply, I don't have the actual figures with me, but you can go through and pick them off and it'll tell you which ones are for Yellowstone. I tried to have my techs go through that, we'd look at pictures, I'd show them pictures. I can do it fairly well, but I had different guys all year long. Size was a big thing, especially in the fall. That's when we found most of our Yellowstone cuts because they're extremely small. Then, in the spring, naturally those fish were from the prior year, so they're easy to see; they were big enough to see the differences. So fall was the main one between rainbows and Yellowstone cutthroats. At first we did it by size, and if we weren't sure, we would take maybe one or two fish back to the lab and then we would look at it under the scope to make sure we were right.

Jerry O'Hair: I've got a question. Going back to Standard Question #6, you indicated that you felt that drought was especially influential, but you apparently didn't feel that the other items on the list were. Evidently you don't consider them as great an influence or to be important; is that correct?

Al Zale: Certainly the drought was something that we saw that could have had an actual substantial effect on our findings. I think with some of these other things, I'd be speculating. It would be kind of a reach to make connections, so I don't feel comfortable doing that. But with drought, I could see it.

Doug Ensign: I'm a little slow, but I wanted to go back to a question that Andy had asked. I'm not quite sure what you meant by your answer. Say, for example, in the normal years with normal flows, you have a side channel with a number of juvenile fish in there, and that side channel normally dries up and isolates a number of juvenile fish. In the sense that those side channels do dry up in normal years, are they less important?

Al Zale: I think it's almost an ideological and philosophical sort of thing as to how you might interpret this drying up in a side channel. On the one hand, as an angler, that would disturb me. I'd be unhappy to see those fish dying there because then they're not going to contribute to the fishery. On the other hand, the bird and mammal people might be really happy about that, because they see that their animals are getting fed, and that might also be providing nutrients to the soil for the riparian vegetation. It's a naturally structured and functioning ecosystem. It is going to have pluses and minuses, and there are different ways of interpreting it. So it's hard for me to say what's good or bad.

Doug Ensign: But strictly as far as the fish population is concerned, those side channels, because there are so many of those fish that'll be isolated and die there?

Al Zale: I don't know. It would be interesting to find out just how many of them do get isolated and die. We can walk out and see a few hundred dead fish, but there might have been thousands that profited from being in there, and who were smarter and got out. I don't have data to suggest one way or the other; whether that's a good thing or a bad thing.

Doug Ensign: And maybe I'm asking questions that we are not supposed to be going into; I'm sure you'll tell me that.

Al Zale: I understand your frustration with it. I'm also frustrated because I can't really answer your question.

Doug Ensign: But then also, those side channels that do provide cover say during high water and so forth, the fish that would survive from that side channel that naturally moved back into the river, and at that point, the main channel system would become more important to those, than the side channel would. So the side channel might only be important during flood stage.

Al Zale: It certainly was these last two years, but if they were in for months, then they could be important over a longer period of time. Hypothetically, say that growth and survival was better in those side channels than in the main channel. Then the longer that they were in the side channel, the better off the fish would be, when they eventually have to go back. Possibility? I don't know.

Doug Ensign: Just one other question in regard to the spring creeks. Would those be considered side channels as well? I'm assuming they would.

Al Zale: I really can't speak very much about the spring creeks at all. I haven't worked on them at all. Certainly they have certain features about them that are related to side channels. At times they have been side channels. I really think it would be interesting to study those spring creeks and find out what their real contribution is. I don't know.

Brant Oswald: I had a couple. I wanted to revisit something that I saw it up on the graph. The first question I had, and I didn't see in our briefing report, concerns the definition of juveniles versus subadults. I think I saw it on one graph, but that was slightly different for different species, but ranged between 100 and 135 millimeters.

Al Zale: It's a good question, because I don't necessarily have a very good answer, in that it comes down to an interpretive thing. I looked at juveniles as the youngest age class that was out there at any given time. So, in the spring of 2001, that would have been fish that were born in 2000. Summer and fall of 2001 and the spring of 2002, that's the 2001-year class. And then this last summer and fall, those were the fish that were born earlier in 2002. Some other fisheries biologists here might disagree with me as to how to define that, but I wanted to deal with just that one age class at a time.

Brant Oswald: And again, from what I saw on our presentation graph, it's that group of fish then that is lumped by size?

Al Zale: Right, and by lumping by size, we're hopefully lumping by age.

Brant: One other thing that surprised me a little bit, having fished a lot for salmonids in this river for a long time, was the small number of whitefish. Obviously there are a lot of whitefish in the system. Why were those so few? Was it just difference in habitat of where those juveniles are?

Al Zale: Doug, do you want to try to answer that? I will add that what I found kind of striking was that there was so many whitefish in the side channels. There were more whitefish than trout in the side channels, and that was the opposite in the main channel habitats. Doug, do you have any observations about whitefish and where juvenile whitefish might be?

Doug Rider: I was surprised too. I can't recall the exact numbers right off, but we did get a large number of the whitefish, I'd say half of them were subadults or adults. The juveniles that we did find were usually at a point bar in the slow water (right off where it's coming around). We'd also find them in that backwater, or they did like gravel substrate on an outside bend with some flow. That kind of substrate, that kind of flow, with those conditions, was not that common in our studies (considering what we looked at). More common was large cobble and slower velocities, and we just did not see whitefish there; but, because of the size, I'm not sure why.

Laurence Siroky: I have a question. How did the findings of your study on the Yellowstone compare to other similar studies that you've either got direct knowledge of, or that you have done yourself, or other people's studies? Specifically in terms of your findings?

Al Zale: In terms of which findings?

Laurence Siroky: The numbers of fish in the jetties and the riprap. Have you looked at other river systems and seen similar kinds of things?

Al Zale: I haven't looked at artificial habitats on other river systems. I have looked at densities along natural banks, and one of the things that surprised me is that the densities here, in whatever kind of bank, are relatively low. As far as comparing our findings to other studies, there have been a number of studies on smaller streams that have suggested that stabilized banks aren't as good as natural banks. There are a fewer number of studies on larger rivers that show some results that are similar to ours. And those were on straighter stretches of riverbanks that don't have much in the way of structure around these elements, and that also appear to maybe have some benefit associated with having boulders thrown into it.

Joel Tohtz: I have a question for Doug. In your catch—I don't want to hold you to an absolute quantitative value, but just roughly—how many of the small fish that you caught weren't salmonids?

Doug Rider: I don't know if I can answer that. Other than salmonids, it was suckers, dace, and sculpin. Sculpin was everywhere. Those three were the ones that we caught.

Al Zale: Initially we wanted to address some of those other species as well, but there were just too many of them.

Doug Rider: There were hundreds, maybe approaching thousands, of dace or sculpins in certain areas. So what I did do is: in my journal I would always note which of those three types of fish were there or not. And they were there at almost site, every season, every time.

Joel Tohtz: That's my own experience too.

Al Zale: Doug wouldn't have been able to have gotten nearly as many sites done if we'd tried to track those other things. And since there is this fixation with salmonids, we thought they'd concentrate on them.

Joel Tohtz: I noticed that one of your slides showed those other species, and that's why I actually originally wanted to ask the question.

Al Zale: Oh, you saw that sculpin in the bucket!

Doug Rider: That wasn't intended to be in there.

John Bailey: You keep talking about the density being low. What do you consider a normal or a high density?

Al Zale: These densities are all relative to each other; so they're lower than another density.

John Bailey: By what kind of factor?

Al Zale: Which comparisons are you specifically asking about?

John Bailey: You mentioned that you don't consider the number in the main channel to be very good. What would you consider, in the Yellowstone, what number would you consider good?

Al Zale: First, I don't think I made any comparisons like that in any of the written documents. I just said it here tonight in answer to another question, I said that "the numbers did appear relatively low".

John Bailey: You did say that in your presentation; my question is what number would you consider good in the main stem?

Al Zale: I'm just trying to find out what question you're specifically asking, so that I can address it appropriately. Let me think, we saw numbers here on the Yellowstone of five, ten, sometimes 15 fish per 50 meters; and in some other places where we've done similar sorts of sampling, it was often common to have 20 to 30 rainbow trout in a 15-meter shoreline. So, we're dealing with substantially lower numbers.

John Bailey: The reason I asked the question is: it's become obvious to me, having read your preliminary report as well, that until we get the Fish Habitat Study data, we're going to have a hard time figuring how to use this data. I'm sort of making an assumption that we have to be careful using some of those numbers, or how we might use them.

Al Zale: What I find kind of confusing myself is that there are a lot of adult fish out there in that river; yet, there don't seem to be as many juveniles along the banks as I would expect to see to produce that number of adults. And that's what makes me start to think that maybe we're barking up the wrong tree. That there may be other habitats that we really ought to be looking at to find out where the juveniles are coming from. But I can't be too definitive about that. Maybe the survival rates of those lower numbers fish that are out there are really very high, and they translate into those high adult abundances. But I don't know.

Bob Wiltshire: Mine is a direct follow up to what you guys were just talking about. And I don't know if this is a question that should appropriately be addressed to Al or not. It seems to me that there are historically always years of high and low recruitment on the Yellowstone River. We have no way of knowing, at this point in time, whether those years that you sampled are years of high abundance or low abundance of these subadult fish. Is that correct?

Al Zale: That's correct. We really have no idea. Usually we conduct studies like this in more than one year, so that we can get a couple of different kinds of years. But in this case, we ended up with two relatively similar years. And the fish numbers out there were almost exactly the same in these two years.

Bob Wiltshire: So, if it turns out that these were poor years of spawning or something else, it could just be lower raw numbers of fish in the system. Where, in another year, you could go out and find higher densities in the same habitat.

Al Zale: That could well be.

Scott Bosse: Al, are you familiar with Kurt Schmetterling's report that he did in 2000 on riprap and its effect on salmonid abundance?

Al Zale: Kurt Schmetterling?

Scott Bosse: Yeah, with Montana Fish, Wildlife, and Parks?

Al Zale: I think that you mean David Schmetterling.

Scott Bosse: David, sorry about that. In his article in *Fisheries* magazine. What I gathered from it, is that in altered river systems, you might expect to see higher densities or higher numbers of salmonids, whether they be juveniles or adults (in riprap, in jetties, and barbs). But in unaltered river reaches, you tend to see the opposite.

Al Zale: And that was pretty much the same inference that we made from viewing that same literature; right about the same time that they were doing their review.

Scott Bosse: So based on that, would you call your study reach an altered river system?

Al Zale: I don't really know, because it's difficult for me to know what it looked like earlier on. One thing I speculated about—and Mike Merigliano has told me that it's probably not the case—I've been kind of surprised that there isn't more in the way of large woody debris out there. And I thought well maybe somebody came through here and cut down a lot of trees, or for some reason or another, there isn't as much recruitment of large woody debris. And that's why we're not seeing it out there. That's something that I thought initially, but I think I've been corrected on that. It would be really hard for me to say whether it's been altered or not. I wish I had that time machine; it would just be so much easier to do a lot of this work.

Scott Bosse: I guess my observation is, and this is more an observation than a question, I've done a lot of research into channelization and the impacts of channelization on the salmonid populations. And one study that really stuck in my mind, was done in 1969, Pazarri (I think that was the name of the author). He compared stream reaches in Montana and Idaho that were channelized and unchannelized, and this was for adult salmonids. He found there were seven times more salmonids in unchannelized reaches than there were in channelized reaches. So, I think your caveat here: 'don't take this information too literally,' is probably a very good one, and that you need to look at the bigger picture.

Al Zale: I will speak against your point a little bit, though; in that, that study was done on smaller streams, and smaller streams do tend to have more roughness elements (boulders and the like). And when you go in and alter them, you're oftentimes reducing the diversity of those habitats by making something less diverse and more homogenous. In a larger system, especially one like the Mississippi River or something that's been cleared of snags and the like, and you go and throw some boulders in, you're making it more diverse, more heterogeneous; you're creating more roughness elements. Here on the Yellowstone, we might actually be somewhere in between. My impression is that at times, we are increasing the diversity of velocities and substrates that those juvenile fish do like. I think you have to look at where you are along a continuum of stream size, and then also look at diversity of cover that is there. And when you get into bigger rivers, there tends to be less diversity. So some of those studies, looking at smaller systems, might not be directly comparable to ours, but we can be careful about that. And I'm being careful.

Bill Moser: I got lost early on here. Assuming this river is 100 to 110 miles long, do you then have 200 miles of this one meter of habitat? When you throw in grade, you're somewhere around 300 to 350 miles of actual habitat that you're looking at? Okay, you looked at 13 miles, this is where I got lost. What I'm trying to do is get the sample size here, actual sample size, and then you get the statistical significance and degree of reliability. You looked at 13 miles?

Al Zale: Thirteen miles total of sampling.

Bill Moser: Divide that by three times a year, times two years, is six. So, we're looking at somewhere around 1 mile?

Al Zale: It might be easier to do it the other way, to take the 48 sites, multiply them by the 50 meters, and add that up. I don't have a calculator so I can't do the math for you.

Bill Moser: What I'm trying to get to is a factor, and it looks like you're somewhere around ¼ of one percent of the actual riverbank that is out there that you looked at.

Al Zale: That could well be.

Karl Biastoch: When you did this, you took depths when you did your collection of fish data.

Al Zale: Yes.

Karl Biastoch: Did you run those depths against the numbers to see where the shallower the depth, the more small fish you had?

Al Zale: No, not more than just the rudimentary kind of analyses that I showed you this evening, with the different kinds of habitat types and the different depths there. This is something that Doug will be investigating and may have results for you later this year on those kind of site-specific things. If I'm understanding you correctly.

Karl Biastoch: What you're saying is, it seems that the side channels may be of greater importance than the main channel.

Al Zale: I really can't make that kind of comparison.

Karl Biastoch: But would you say that this is something that should be actually looked at in the future?

Al Zale: Yes, I think, what would be really nice to help answer some of these questions is to find out, what the abundances of fish are, what their movements are, what their survival is, in all of these different kinds of habitats. And then you may be able to decide what are the important habitats, and which ones aren't, and perhaps manage things to improve the situation. We've got a few pieces here, and I can certainly see why people were interested in understanding or getting the answer to this question: comparing the juvenile abundances in these different kinds of habitats. And are there juveniles there, in these literal areas, we're messing with the literal areas. It might be a problem, let's find out. And that's one piece that seemed like a very important one to cover first; but there are these others and we're really going to be guessing until all of the blocks are filled in, unfortunately. It gets complicated.

Bill Moser: This was hit on a little bit ago, but I didn't follow. How do you go from ten fish in this 50-meter area to 10,000 fish per mile? How does that correlate? Is there going to be some way to tie these things?

Al Zale: I haven't gone from ten fish to 10,000 fish, so I'm not really sure what you're asking.

Bill Moser: I've heard that in some of these areas, they've measured and they've run out statistical analyses and said there's 10,000 fish in this one mile of river.

John Bailey: But Bill, his data does not look at any of that, so your question is out of his realm. It has nothing to do with the study that Al and Doug were charged to do.

Al Zale: I was leading up to that.

Bruce Rich: This is just a comment. Maybe these guys can tell me if I'm on track with it or not. About that sampling rate question asked, with what we know about the Yellowstone River having differences in slope, substrate, and availability of tributaries (from the Park boundary to say Springdale), their data, I would suggest, is most representative of the reaches within which they sampled, which are much shorter. Therefore, their sampling rates (amount of habitat sampled per available habitat) I'd say is much higher than the worst case, which maybe you represent. That's all.

Steve Caldwell: Do you see anything in your data to indicate that the presence of bank stabilization structures had any influence on the wealth of abundance of different salmonid species?

Al Zale: We haven't analyzed it to that point. I think it might be possible to take our data and try to piece it out to see if there's something like that. I did mention that Doug felt that maybe one of the reasons that in Reach 2 there weren't that many brown trout around the jetties was because there were a lot of rainbows in there, but that's speculative. It's just a feeling that he has about it. We haven't looked at those numbers. But that might be an interesting place to look.

John Bailey: Any more questions? We're about to move to our General Discussion, and we are going to have a general discussion tonight.

Bob Wiltshire: I have one more question specifically for the research team. In the course of your research was there anything you discovered that surprised you?

Doug Rider: I don't have a lot of experience doing this sort of work, but I guess just from my viewpoint, something that surprised me was the lack of fish that we actually got out. Just looking at the habitat, after awhile I could gauge what I was going to get, and what I was going to see. And I was surprised at the low numbers a lot of times—on all species of fish. I think that was the main thing that surprised me, only from my perspective.

Al Zale: I just had to look it up, because I knew I used the word "surprised" in my report, and I wanted to make sure that I got the right one. Frankly, I was a little bit surprised with the results. Based on most of the literature out there, altered habitats aren't as good for trout as are natural, and so our results were a little bit surprising. But I think that there are good reasons why we saw what we saw, now, in retrospect, in thinking about it. But it was a little bit surprising when you collect data that conflicts with dogma.

Scott Bosse: One more question. Did you find that maybe part of the reason there were more fish in the stabilized sections was because you're sticking your probe in the riprap and a lot of those juveniles are in the interstitial spaces between the boulders, and you can actually maybe pull them out a little bit easier? Whereas, in an unaltered areas (maybe a less complex streambank), where there's sand and a couple boulders, it's easier for the juveniles to escape?

Al Zale: Well, they don't go very far. These are small fish after all. They're not the bigger guys that go shooting away from you. These are relatively small fish that kind of dive for cover, and they have a tendency to stick their heads under a leaf or a piece of cobble. And they think, they can't see you, so you can't see them. They kind of have that perspective. So in that sense, my guess actually was, I was expecting that, they would be easier to capture in less structured habitats. I was afraid that maybe fish were going to get lost down in amongst the boulders of the riprap, and that we might have lower capture probabilities there. But, as you can see, we did do the math and found that the capture probabilities were not significantly different among the different habitat types. So, no, we didn't see any of that.

Bill Moser: Did you observe any attractor fields?

Al Zale: I'm not sure what an attractor field is.

Bill Moser: In Chaos Theory.

Al Zale: That's over my head.

John Bailey: Thank you very much Al Zale and Doug Rider.

4. General Discussion Session

John Bailey: We're now moving into a general discussion, and tonight I'm going to start this session by asking Bob Wiltshire for his thoughts. We had a discussion, when this was first proposed some years ago, I don't know quite how many years ago then, and you said to me that when you were with FWP that they were always concerned about juvenile recruitment on this river. And you thought that this study was going to be very good and it might help to show that there are ways to help recruitment. Would you now comment on what this study has said to you in the broader sense, with regard to that discussion we had.

Bob Wiltshire: John, we've discussed so many things. I don't remember that specific conversation. But one of the things that strikes me is something that I mentioned earlier: we won't know for a couple of years whether these were high or low recruitment years, and I would be very interested in knowing that. I don't think that that necessarily would have any effect on where the fish were found, but just in the total numbers of fish that were found. I think there are a lot of things that could be playing into that. I'm not surprised because—if you go out there and look at the Yellowstone after a high water period—there are not a whole lot of secure places for young fish to be out there, and those browns are hungry. I'm really not surprised about some of that. I don't know, is that what you wanted me to comment on?

John Bailey: I read Al's report, and it certainly didn't say what I thought it was going to say. Since we hear so many bad things about jetties, I was surprised to see that, at least for juveniles, they are so heavily used.

Bob Wiltshire: Well this doesn't tie directly to your question to me. But one of the things that I see that hopefully we can still get out of this is some practical advice as to what's a good and a bad jetty in terms of what the fish see. And the same for riprap or other types of structures. Whether Doug can pull that out of the data or not, I don't know. But I would sure suspect we could see some individual site differences that might be interesting.

John Bailey: Having read the report before this meeting, it became obvious that the February 25 Fish Habitat Study presentation is crucial. It will hopefully shed some more light on what some of these matters may mean in the bigger scheme, because we're only looking at one thing. I expected to see some results or something that will give you better recruitment. But basically the data show, at least what Dr. Zale says, is low densities. So it seems that we have yet to find the magic button, if we want more recruitment.

Bob Wiltshire: But again John, I'd say we still don't know whether those years are the years that are here on the graph, or those years are the years that are here on the graph. I think Joel might be able to tell us in a couple of years, whether those were good or bad recruitment years; but I don't think he knows yet.

Joel Tohtz: Actually John, I want to address a lot of this. You mentioned a discussion with Bob about this recruitment issue, with certain juvenile fish. And that concern is universal everywhere, because young fish are where older fish come from. And we have assumed in a lot of systems that we will have different rates of production of young fish every year, or at least they will vary over time—some years good, some years bad. And so, if that's true, then youth class strength—as Bob is getting at—has to change. Sometimes it's good, sometimes it's bad, in the sense that it's more or less. However, on this river, and I want to make this point very strongly, we have never measured population changes that are tied to recruitment limitations. In other words or another way to say that is, this river, at least in terms of trout, is not recruitment limited. So we might have low numbers of fish produced some years compared to other years, but we do not see that expressed in meaningful differences in the number of adult fish that we sample. Those are the fish that are large enough for us to pick up in the main river samples with our electrofishing gear. And that's one of the most remarkable features of the river—its resilience over time. So, we've had flood years (large runoff events) and we've had drought years, and we still see roughly the same number of fish when we go out there and sample different sections of the river. We still see them distributed roughly the same, in terms of the size and age structure for those populations. That's a remarkable thing, and it's also wonderful; it's what makes this river what it is. And I have one more comment, as part of this discussion: I've heard a lot of this, "well there's fish there so that's a good thing, and there aren't fish there so that's a bad thing". We're using the sort of presence and absence of these young fish as sampled in the study, and we're making a pretty big leap to say, therefore, in our abiding judgment, "this is good" or "therefore it's bad". There's nothing in the study that tells me a jetty is good or bad. It just simply says that fish use them or they don't, and that sort of thing. I think that it's important, as we come through these studies and begin to synthesize all this information, that we need to keep that kind of thing in mind. Because, in my mind anyway, it's very important that we consider, rather than do we have more fish (which is always good), do we have a system that will keep producing fish, keep showing populations of adult fish that do not have meaningful differences year after year, after year? And that's a different question. And the kind of information we're bringing from all the different studies, answers that in a very different way. And that's where we can get recommendations for how to treat certain sections of river, if a bank needs to be stabilized, and so forth.

Andy Dana: I'd guess I'd just like to clarify my questioning about Dr. Zale. I did not mean to suggest that side channels were bad things, I'm just concerned about what the data tells us about how important side channels are, vis-à-vis other diverse habitats on the Yellowstone. I think Joel has actually said it better than anyone, that fish use them. We don't know whether that's important or not, because we don't know how intensely they use other habitats during those flood stages, that hasn't been studied. But I don't think that we should not have side channels, I just think we need to be cautious about some of the conclusions we draw. That's what I got out of that.

Bob Wiltshire: This is real different, and I didn't chime up because we're into real speculation here but, both Andy and Doug talked about fish being stranded in side channels as the water goes down, and I also have seen that a lot. One thing that I've done a number of times is I've taken nets out and actually looked at those fish; and in my experience, the huge majority of those fish tend to be suckers. That's purely personal, anecdotal observation. I don't know if Doug saw anything in the course of his study that would lend credence to that or not, but that is something. You see these pools with these hundreds of fish, but if you go looking, they're all suckers.

John Bailey: The next time you need to go to the Corps and have projects put in the river, will you use any of this data to say: this would be a better project, this is better for the juveniles? I'm just interested. The Corps has said, in a sense, that they want to move away from riprap, and they want barbs. Now, would you argue with them?

Doug Ensign: Clearly, there are some places where, for example, just solid riprap needs to be used. Whether it's better for fish or worse for fish, I believe if it's economically and socially very valuable property that you're protecting, then it seems to me that you overlook the fish in that particular instance. I believe though, that generally speaking, bank stabilization needs to be minimized as much as possible, firstly. Secondly, that when it does become necessary, that we do need to take into consideration all of these things that we've been learning in regard to fish, in regard to riparian vegetation. Yes, we need to keep it as natural as possible, but at the same time we're here.

John Bailey: Dave, you do 310's. Does this data say anything to you on how you might look at 310's?

Dave Haug: Well, I guess we'll have to add up all the factors together because our prime goal is similar to Doug's, how do we try to work all these factors together. I think as time goes on, we're going to see more and more implementation of some of the softer techniques, too. In some places they will work, but in a lot of places they will absolutely not work because you don't have five or ten years to get them established. You know, if they don't take the first one or two years, you've got problems. There's got to be a blend of the right ideas out there. A lot of this data's going to help us drastically look at a lot of factors. And Joel will go down our 310's and we take his input—it's real valuable. And so he gives us a lot of the input from the fish side, and we look more to the input as far as what we think is going to hold up on this stretch of bank, or what's good or what's bad, and some of the other factors mechanically come into play there. So that's what we look at.

Brant Oswald: The main point that this has raised, and I'm sure Doug Rider and Al would agree, is that what we've looked at tonight is just one very, very small piece of the puzzle. It's an important one, but it's a very small one. And again, the only frustration I have as a Task Force member is that as we start winding down and we're trying to get to a point to make recommendations, we've got a little bit of data here that will help us make some of those recommendations, but it's a very small piece of the puzzle. We're only looking at juvenile fish, and as we try to make recommendations based on different technologies (again what Bob has raised a little bit ago), if we're going to try to judge which technologies are good and which ones are bad, this gives us a little bit of information. I was struck by a few things that I jotted down as we went along. One of the things was, even though as an angler I know how important side channel habitat is, the real end numbers in how many fish they found in the study actually seemed extremely low to me. I know those are important habitats, and actually it seems like those numbers should have been a lot higher. I'm sure that was influenced by low water years. But some of the questions that raises concern the densities of the juveniles in those side channels versus the main stem; should we really be expecting to find many juveniles in the main stem no matter what the habitat? One question I had is with conventions. And again I think one question that the Task Force needs to think about is, how important are tributaries versus the main stem in terms of recruitment? I think from a fisherman's point of view, the common knowledge would be that those tributaries are especially important for the spring spawners, for rainbows and cutthroats. I was struck by one of the things in terms of

species distribution, which is why I raised the question: why did you not find more whitefish? Another was, it seemed like the cutthroat numbers were low. The general distribution for rainbows and browns seemed sort of where most of it is. And again, from a fisherman's point of view, I was struck by the fact that there weren't more cutthroats there, and I'm wondering where they were? Again just looking at it in terms of looking at juveniles versus the older age classes, if you stop and think about how big 135 millimeters is, from a pragmatic point of view as an angler, that's real small. We talk about functional categories, I think "dinks" as being the low end, I mean that's definitely "subdink". We're talking about very small fish, and those are not even the fish that most of us are aware of when we're on the river. So, as we're looking at some of those older age classes, and this information is thrown into the discussion, we need to remember that one of the things that we've talked about: whether riprap or another kind of structure is good, and one of the issues that Al brought up was that there may be use in those eddy sections around barbs or jetties for these very small fish. And certainly, then we look at what those structures look like in low water and we may have something that is not good fish habitat at different water levels. My general impression—being a person that fishes the river—there are times of year, in certain flows, and when there's certain food available, that some of these structures (riprap banks) hold a lot of big fish too. But I also find my practical point of view is that at other times, those are deserts and you don't find fish there. Those are some of the sorts of issues that we need to think about. I guess a long-winded discussion is to say that we've got a teeny bit of data here that we can throw into the discussion, but there are a lot of other factors that we need to think about. Not to think about one structure as necessarily good or bad, just from what we've seen tonight.

Joel Tohtz: I want to make this comment. In my business, we routinely use a very little bit of really bad data to make some pretty important decisions; and we get kind of comfortable that that can be done, with a lot of checks and balances. I think we have a tremendous advantage here, that we're going to have a little bit of really good data, and for me personally, this is kind of a happy picture. I thought I'd just throw it out here and let people hear what I'm thinking.

Karl Biastoch: Basically, barbs and jetties I think are basically neutral. They don't affect it that much, they're not negative and they're not really positive. The fact that you can't find where your fish are going, may be due to the fact that cutthroats have a tendency to float downriver. They move out into the middle, and the current just takes them on farther down, and then they come back up. The barbs don't really attract them that much, but the side channels may be of more importance all the way along the river. That's habitat for these smaller fish, the rainbows and the cutthroats, and so that's one of the things that they should probably look into.

John Bailey: Karl, you said "neutral", but in reference to what? To juveniles? Or neutral to everything?

Karl Biastoch: Basically neutral to everything

John Bailey: Thank you. I just wanted to document how you answered.

Bob Wiltshire: One thing that I've been increasingly struck by, and it was presented to us in our geomorphology study, and I have been finding myself looking at these graphs with increasing frequency. We all talk about, and Dr. Zale referred to it tonight, that he wished he could have been out here for some "normal" years or "average" years. As I look at these graphs, I'm just struck by the fact that there is no such thing as a normal year on the Yellowstone. It's either low or it's high, and we come up with an average by averaging extremes. And we obviously, in the last couple of years, have been in some of those low extremes. We have no idea what any of these factors will do at the high extremes. Just a comment that I want to throw out. I'm just really struck, if you look at these annual discharge or peak discharge graphs, they are just dramatic. And then just one quick comment, in terms of the abundance of cutthroats, and Joel could correct me on this, my understanding is that the sections that these guys worked on are probably in the lowest density sections on the river for cutthroat populations.

Joel Tohtz: Yes, but they are increasing.

Bob Wiltshire: And that there is virtually no identified spawning of cutthroats to a big extent in those sections.

Joel Tohtz: Yes.

Bob Wiltshire: There's not the major spawning tributaries where cutthroats are found.

Joel Tohtz: Except for the spring creeks. They don't occur.

Bob Wiltshire: You're above the spring creeks, with these data collection sections, right?

Al Zale: We're both above and below. The upper reach extends from a bit downstream from Mallards Rest to just upstream from the confluence of Nelson's Spring Creek. The lower reach begins at Carters Bridge and ends at Mayors Landing.

Bob Wiltshire: I think it remains to be proven that the spring creeks are major spawning streams for Yellowstone cutthroats. That's not to say they're not significant. I think it is yet to be proven that they are major.

John Bailey: So Andy, do you believe spring creeks are not a major influence on the cutthroat spawn?

Andy Dana: I'm not a scientist; I don't have the data. From what I read and studies that have been done, my understanding is that they are major, in fact THE major spawning ground probably between some of the tributaries further up the valley and all the way down to Springdale. There have been data in fact showing fish migrating I think 15 miles to spawn in the spring creeks. Bob, you're a biologist, so I don't want to dispute that.

Bob Wiltshire: No, if I could follow. I think you might be misunderstanding what I'm saying here. I was very clear to say that I'm not saying they are not significant, because I agree totally with Andy. They are virtually the only source of cutthroat reproduction that's taking place in that section of the river. There's a difference though between a "significant" contribution and a "major" contribution. I think they're making a major contribution in rainbow trout numbers. I think if you compare the shear numbers of cutthroat trout coming out of the spring creeks with the numbers of cutthroat trout coming out of streams like Mol Heron Creek and some of these others, you would not say that they're on those magnitudes of numbers. It doesn't reduce their significance. If anything, it makes them more significant because they are the only contributors.

John Bailey: Is there any data to show what you just said?

Bob Wiltshire: I think there's fully significant data. I know there is on the mountain streams. There's been quite a bit of fry trapping done on out-migrants on cutthroats and that data is available.

Joel Tohtz: We have good information on migrating fry from connected tributaries upstream in those areas where adult densities are highest. We do not have great information about out-migrants from the spring creeks, and that's sort of the missing piece. I would agree with Bob—except that I don't know what he means by significant and major—that those spring creeks are definitely important to continued persistence of cutthroats in this area of the river. So in that sense, they are very significant. A lot of tributaries in the Paradise Valley, particularly as you come down the valley, are cut off from their functional connection with the Yellowstone River late summer months, for whatever reasons.

Andy Dana: Just making another comment, shifting directions, I also want to reiterate the importance of being careful with this data for making recommendations on the whole length of the study area that we are doing. Because this is a very limited area and we know nothing from this data about Gardiner to Mallard's or east of town; so we've got to be very careful with this thing. But addressing your question, John, that you asked of Doug: whether a landowner would use this data or be interested in this data in a permitting context? I think it would help the landowner try to shape any applications. If we do get some more technology showing what size riprap, rock, is good for fish, or whether barbs are better than jetties, or what kind of barbs, or so forth, then I think it would be very helpful to submit that data to our engineers who design the projects and say, we want to try to address these design concerns, and hopefully the Corps would get the same thing out of it that the landowners would.

Laurence Siroky: John, earlier you'd asked for Doug's response and Dave for his response, and I was going to ask Mike Gilbert for his thoughts on the use of this information as far as the Corps' permitting is concerned.

Mike Gilbert: I figured it would come my way sooner or later. Tough question, that's why we are here.

As I'm listening to this meeting, and previous meetings, there's something taking shape in my mind. Number one, all the investigators have stratified by geomorphic reaches, by different types of treatment of stabilization versus natural banks. And what we have—and I would disagree with Andy here—we do have some scenarios developing where this is sampled and we could possibly extrapolate to other areas. That's what we're looking at too, in terms of context. We did stratify by different treatment areas, and from that hopefully we can say for a specific reach certain types of structures are more compatible, while other types of structures are less compatible. That's where I think we want to go in terms of the recommendations and direction that we get from the Task Force. I remember Mr. O'Hair's comments—I think it was at the socio-economic meeting—there was something in regard to the agencies have to decide what's compatible. We are willing to work with this group on that issue. And there were other comments made as well, about getting technical assistance to help landowners, and get general design considerations that may be more compatible for specific problems or specific reaches. I think that should be one of the primary roles of the Task Force. If you push these ideas, along those lines, then we can work with you on that. That's where I think most of this is really going.

Doug Ensign: I agree. What I find frustrating in the presentations that we've seen so far—they've been very good, I've learned a lot, and there are a lot of things there that I am going to apply personally—but at the same time, to me, I'm frustrated because there's so much that still needs to be researched. Still so much that needs to be done, and I think that maybe the biggest recommendation that we could make is for us to continue to research, to try and find those suitable structures.

Karl Biastoch: The information they gave today showed some things that were positive but the low numbers and the fact that some of them didn't have a lot of fish also, and the fact that they didn't get a lot of adults in some of these areas. It's kind of hard to say that the barbs and the jetties are really negative. The riprapping in some places may be beneficial, but in other places it's not because it causes other damage to other people. But basically, I think there's going to have to be more research into some of these areas, to figure out what is best. Specifically, probably more about the size of the riprap to be used, and whether that would be of benefit.

John Bailey: Any other discussion? One of the things I found reading the Task Force stuff late last week, was that there has been this evolution to go from riprap to barbs, and an evolution to 40-foot barbs. And I keep asking the question why 40 feet? But I'm not really satisfied with any answer I've gotten on that. But at least this data, on a very narrow band, sort of said maybe that needs to be looked at more, and I'm really looking forward now to the Fish Habitat Study. Whether it's going to fill out any of this data on these structures, I'm not sure, because I'm not exactly sure how they're looking at, and if they're looking at those structures very much. It certainly made me start wondering about this sort of change that was set, and I think as a Task Force, we're going to have to try and wade through that and have a fair amount of discussion. It's going to be wide ranging with the data we have, but this study, in my mind, made me want to ask more questions, than it did answer any questions. We have a couple FWP people here, I wonder, might they want to try to do something with some of these fishery studies into the future? It would be one of my recommendations, that I'd probably try to recommend that as we start to make recommendations. Joel, you look like you want to say something.

Joel Tohtz: No, I just realized you're just telling me something.

Bruce Rich: This is just maybe a thought or observation. But as we see the Fish Habitat Study here next month, and perhaps we're able to start synthesizing all the results of these studies together, we might be able to see a clear picture. But I just want to throw out a thought that what we saw here, frankly in my opinion, was not surprising as far as when we knew we were going to be sampling these coarse, manufactured banks. I think most of us that have done some of that kind of work before felt that we were going to see some fish there, and likely in higher densities than other places. What I'm trying to say is this, that I think there may be some things to be learned here about what treatments might be optimal compared to others, when proposing future bank stabilization projects, but also, let's not lose sight of the idea that if we keep putting those projects out there, we may be doing other things to the dynamics of the river, and how it acts, particularly in high flood events. And perhaps to some degree, if we keep putting those in there, we'll have positive effects, and then maybe there's some threshold out there at some unknown place, in which case things will become quite negative. Just a thought.

Bill Moser: The Chair asked last week about discussion, so this is a little change in the pace here. But I'd like to introduce hopefully some time before this committee dissolves, that it looks at the concept of highest and

best use. Let's say that John is floating down the river by the weeping wall after a big rain and he looks up about 60 foot up and sees a 350-foot dinosaur skeleton on the side of the river. How does this affect what the Task Force is recommending as the best use of the river? Somebody puts out on the internet that they've found this many grams of gold per 100 pounds of sand and all of a sudden you've got 20,000 people swooped down on the river. The crime rate goes up 2000 percent in the City of Livingston or Park County, and a lot of infrastructure changes. There's a lot of things that peripherally need to be looked at in terms of having a recommendation structure that might not have anything to do with fish or other things of that nature.

Doug Ensign: Bruce, I thought that was a particularly compelling statement that you made, but I do agree that probably less stabilization is better than more and so forth; but your idea there about if we continue to add structures to the river, at some point it is not beneficial; what is that point? How will we ever know what point that is, where it becomes—I don't even know the terminologies now because we can't use "dynamic equilibrium" or "health" or anything like that—so at what point does it become bad, or irretrievable? And I don't know if we'd ever arrive at such a point until maybe after it passed us by; of course then we could take them all out.

Bruce Rich: I'm not sure if you wanted a response. But one of the things that I had in my mind when I was saying this, is that one of the things that we know about these stabilization structures (and I can't say this for a fact) is that when we take away the river's ability to expend energy on a piece of riverbank by armoring it or stabilizing or revetting it or whatever you want to call it, is that that energy goes someplace else, and gets expended in some similar or other way, in another place. And a way that I can envision in my head us getting to that threshold, wherever it's at, is that we take away enough of those places where the river expends energy by eroding banks, which is what it does naturally, and what we end up doing is increasing the need to revet the few unstabilized places left because then the river wants to take it's energy out there, where it can. And we basically get into a fruitless cycle throwing project after project as we need to. I guess that's a progression that I can envision, that's all. Where if a threshold would come of that, that we would have perhaps runoff events that would become less survivable by fish, for example. I don't know where that might be, but I can envision it being out there somewhere.

Jerry O'Hair: Well, I guess that I have to take a little bit of exception to the fact that the river is losing it's dynamics or its power, when it's eroding a bank. And I'm particularly thinking of Mallard's Rest, the Weeping Wall, and on the left side of the river from the Pine Creek Bridge down. The river has no way of accessing that area to expend its energy, so it's just doing nothing more than just eroding. So, I've got a little bit of a problem with that sort of thinking. Along with the riprap versus barbs, and some of these other techniques that we have been approached to use or are trying to be used on the Yellowstone River, we've also got to look at some of these techniques as strictly experimental; and in some instances, they don't work, period. I can pretty well speak from experience that I know that on some portions of this study area, that probably the only thing that will work is hard riprap, unless there's some other type of, something new that comes along. Barbs and jetties are rather iffy, whether they work and whether they'll work for very long. That's the only comment that I've got about the fish study, the small fish study. I was particularly interested in it, and I think that it's given us some valuable information. But I think that we have to look at some other things along with that to say that riprap and barbs are not good, or are good, as far as fish habitat goes. But I know that certain ways of trying to hold the river, or keep it from eroding the banks, just don't work. They may be fish friendly but that has never been proven yet either; so I'd be interested in a little further study on this particular subject.

Andy Dana: I guess since Bruce raised it, it's getting a little far a field but maybe Chuck has some idea about this. I'm also a bit skeptical, or I wonder, about this energy theory about riprap and barbs passing energy down the river. Because the whole idea of riprap is to create roughness along the bank, which slows down velocities and reduces erosive effects. If you build it right, it's coarse and it dissipates energy; same thing for barbs, they dissipate energy along the bank. It may put it out into the thalweg a little bit further, and maybe that's where the velocities increase, but I don't know that there are any definitive studies that show this effect of increasing velocities off of the riprap bank, or barbs. And secondly, I think we need to keep some of the results of the hydrology study in mind, which show that even if you do a half-mile-long berm (I think they showed that diagram at Carter's Bridge) the downstream effects seem to drop off radically. I mean very quickly downstream from that type of a structure. It's easy to generalize, but some of the data that's coming back may not support some of the preconceptions, as Dr. Zale found tonight.

John Bailey: Any other comments? Discussion? Thank you then. See, we had a good discussion tonight.

V. Other Business

John Bailey: It's 9:30 now, so we will not be addressing our next agenda item tonight. But at some point we have to deal with the Steps for Formal Action. Finally, Chuck, are you going to be ready to come back for a follow-up Geomorphology presentation in early April? You have to be by then.

Chuck Dalby: That's what we're going to shoot for.

John Bailey: Okay, because we need to find out, and then we'll have to try to set a date. But it has to be very early April, so we can start moving. Okay?

Chuck Dalby: We can certainly do another presentation, but we may even need to follow that up with an additional presentation because some of the information that we're getting from the USGS-BRD, I'm not sure when exactly we'll get that.

John Bailey: Then that information may have to come through the TAC. At some point, this group has to start dealing with all the studies. I assume that if the group wanted to invite somebody back to try to straighten us out, that we may go to the TAC then, for trying to mix a lot of stuff together. We have to stop having individual research information come in, and see what we can do because we'll probably ask enough questions to keep the TAC going for ten years. We'll be long gone, but we'll keep you employed. So there is no other business.

Next Task Force meetings:

Tuesday, February 11th, 2003, Wildlife (Bird) Study
Location: Yellowstone Inn

Tuesday, February 25th, 2003, Fish Habitat Study
Location: Yellowstone Inn

Tuesday, March 25th, 2003, Historic Watershed Land Use Study
Location: Yellowstone Inn

VI. The meeting was adjourned at 9:30 p.m.